Impacts of Climate Change on Specialty Crop Production

Carolyn Cook, Senior Environmental Scientist

CDFA Office of Environmental Farming and Innovation

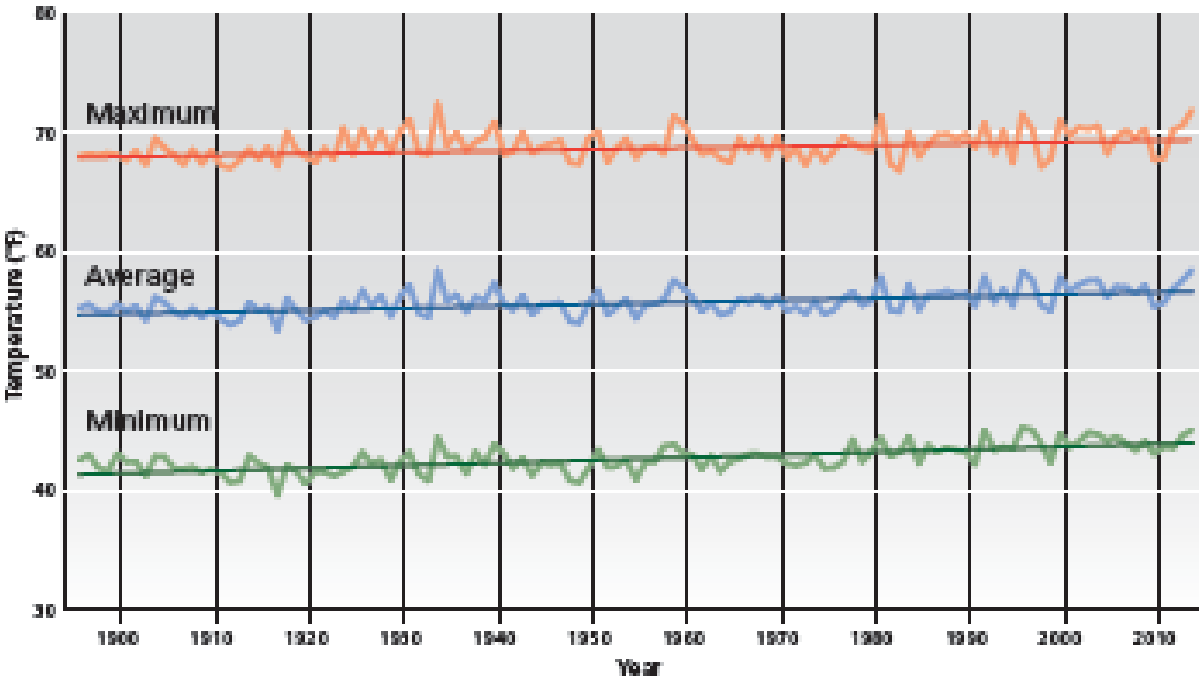
California's Specialty Crops

- California produces over 400 different agricultural commodities and is renowned for specialty crop production.
- Specialty crops are fruits and vegetables, tree nuts, dried fruits and horticulture and nursery crops, including floriculture.

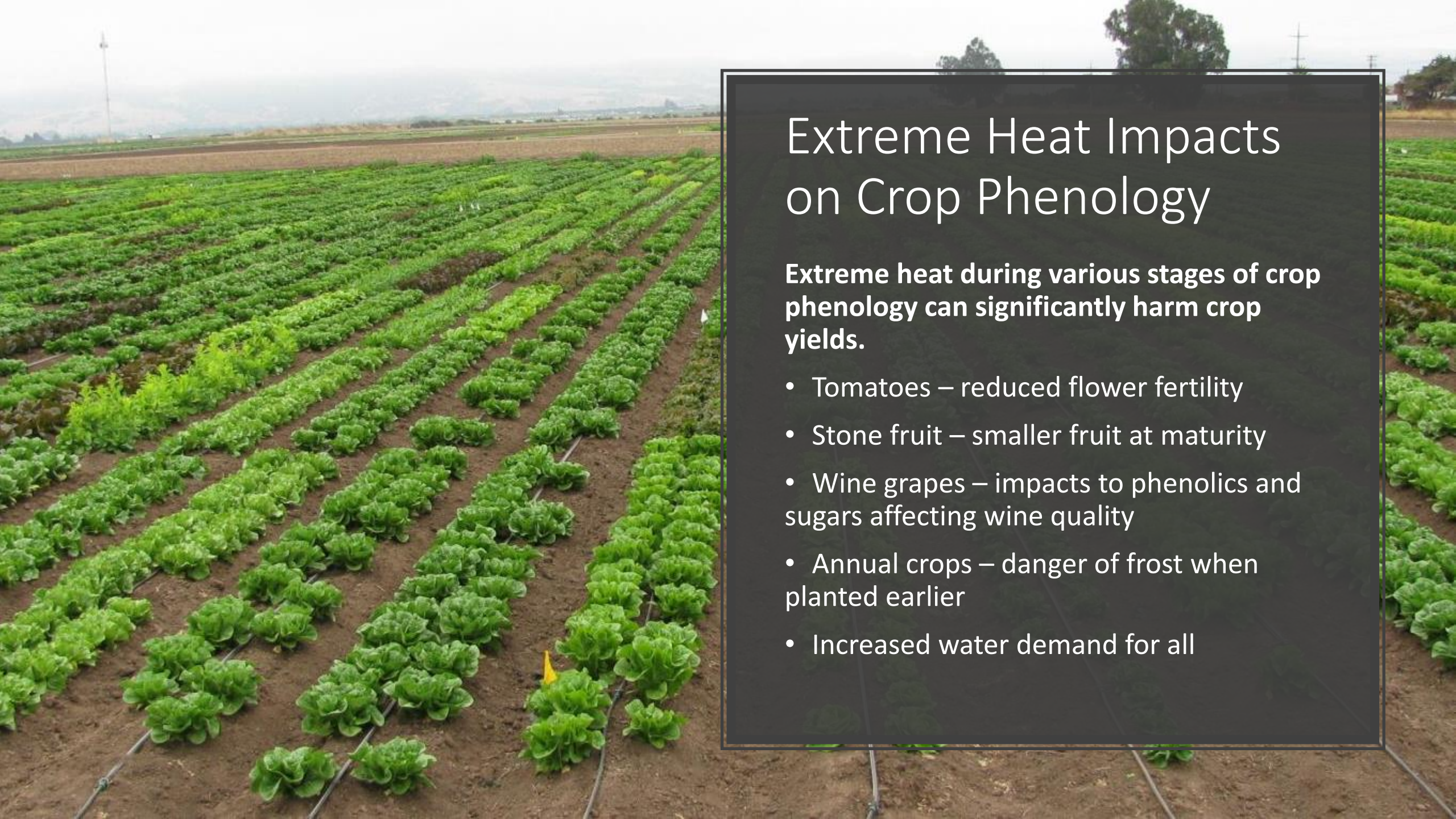
California's Top Ten Specialty Crops in 2016	
Grapes	$5.58 Billion
Almonds	$5.16 Billion
Lettuce	$1.96 Billion
Berries	$1.83 Billion
Pistachios	$1.51 Billion
Tomatoes	$1.33 Billion
Walnuts	$1.24 Billion
Oranges	$826 Million
Broccoli	$779 Million
Carrots	$734 Million

Observed Warming

California has experienced an increase in minimum, maximum and average temperature since the industrial period.



Temperatures in California have undergone a slow but steady warming over the past century. These trends indicate higher wildfire potential, habitat risk, and changing hydrology. Observational air temperatures for California can be found on the California Climate Tracker at the Western Region Climate Center: http://www.wrcc.dri.edu/monitor/cal-mon/.

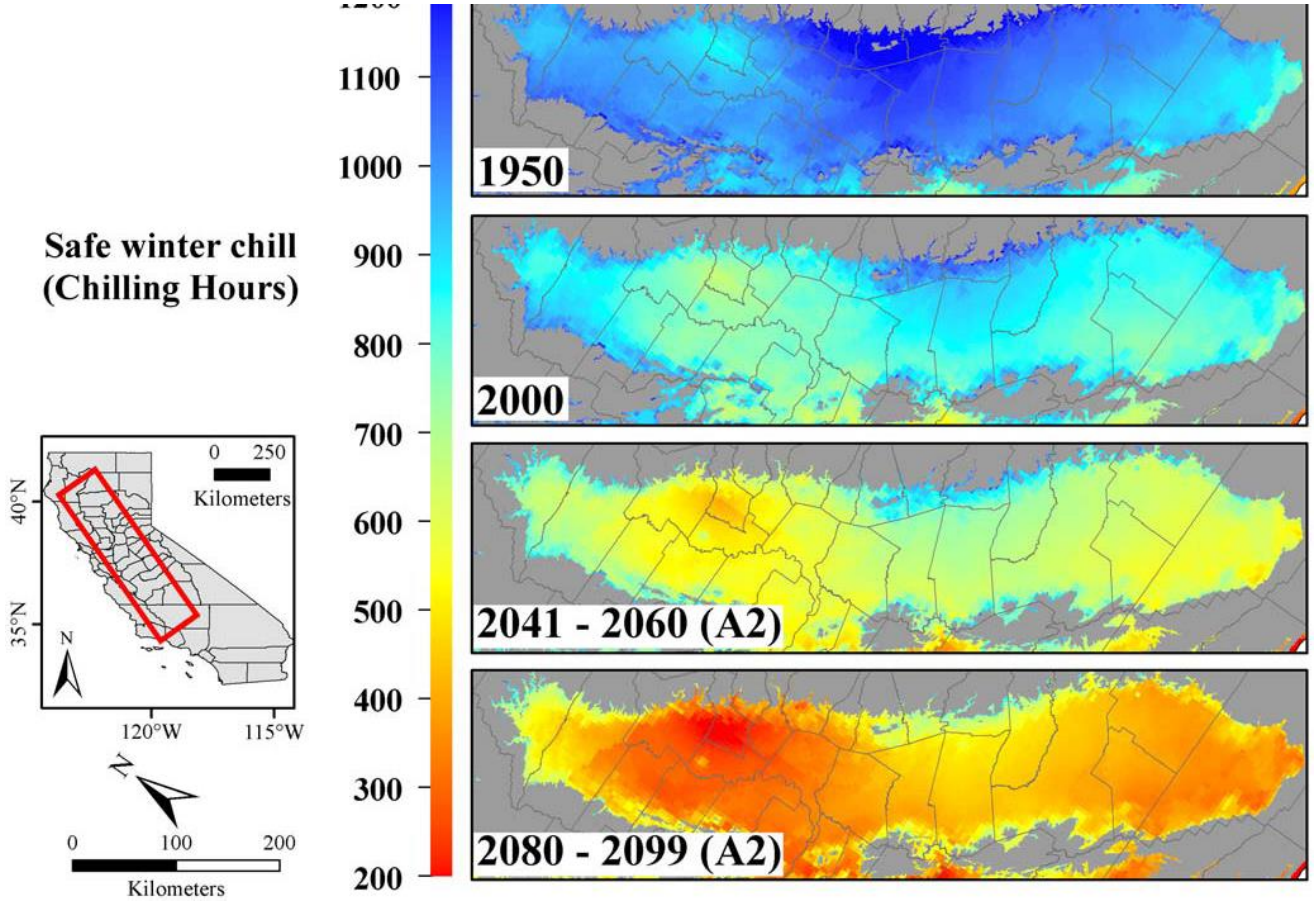


Extreme Heat Impacts on Crop Phenology

Extreme heat during various stages of crop phenology can significantly harm crop yields.

- Tomatoes – reduced flower fertility
- Stone fruit – smaller fruit at maturity
- Wine grapes – impacts to phenolics and sugars affecting wine quality
- Annual crops – danger of frost when planted earlier
- Increased water demand for all

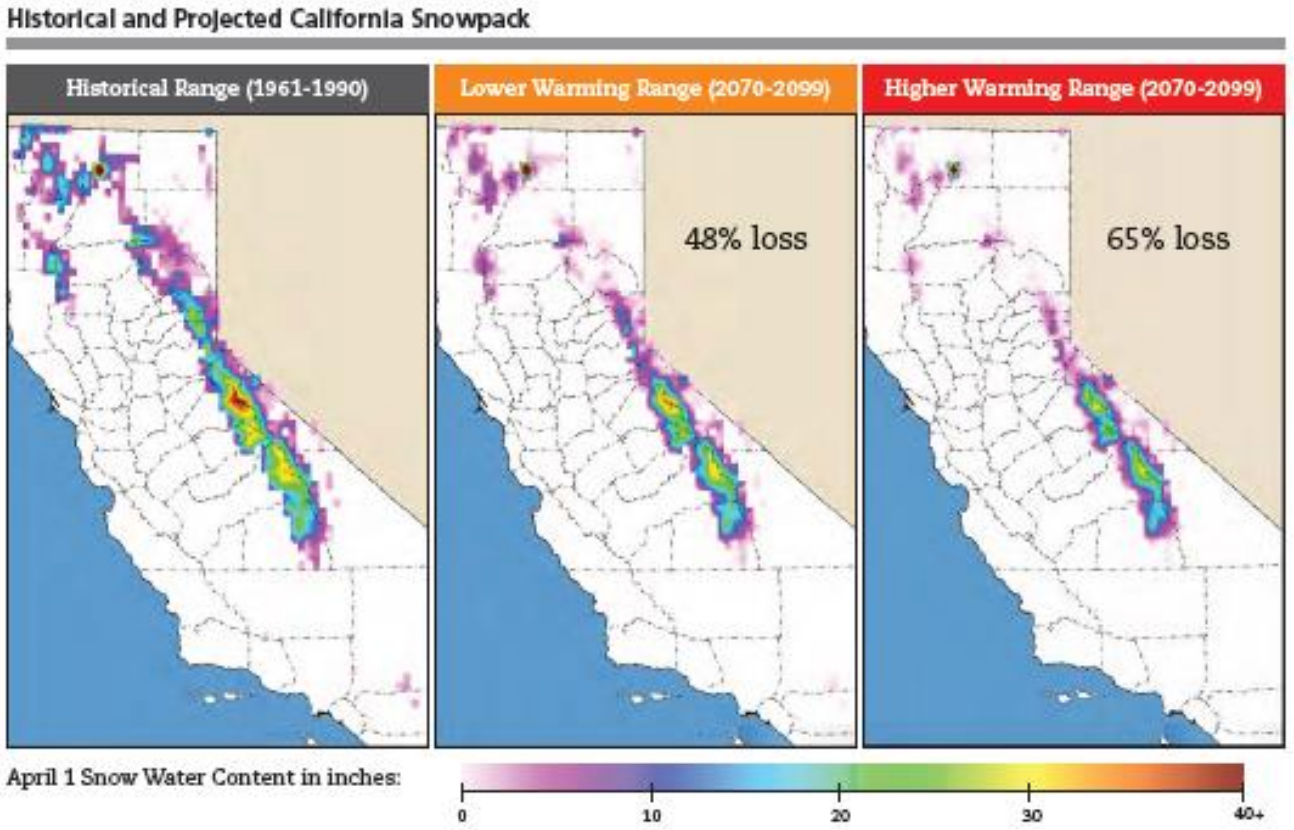
Warmer Winters



- Textbook example of climate change impact on some of California's emblematic crops
- By 2041 to 2060 – winter chill in the Central Valley is expected to be insufficient for apples, pears, and cherries
- By 2080 to 2095 – only 10% of the Central Valley will have sufficient chill for apricot, kiwifruit, peach, nectarine, plum, and walnut

Declining Snowpack

As temperatures continue to warm into the future, more precipitation will fall as rain than snow. Snow elevation levels will rise and California will likely see less snowpack on average.



Historical and projected April 1 Snow Water content for the Sierra for lower and higher warming scenarios depicting the effect of human generated greenhouse gases and aerosols on climate. By the end of this century, the Sierra snowpack is projected to experience a 48 to 65 percent loss from its average at the end of the previous century.

Increased variability in water availability

- 90% of California’s crops rely on irrigation
- Water availability for irrigation is impacted by reduced snowpack, earlier snowmelt and increased variability in precipitation events

Derek Chamberlain of the tomato processor Morning Star says the company's plant in Williams expanded last year, and notes that "a significant amount" of Morning Star's tomato inventory comes from the Sacramento Valley. Tomato production in six Sacramento Valley counties has grown by nearly 1 million tons during the past four years as acreage in parts of the San Joaquin Valley has declined.

Water availability leads to shift in tomato acreage

Morning Star, anticipated the possibility that water and

Crop Shifting

Impacts to specialty crops are just as diverse as the specialty crops themselves.

We can expect to see adaptations taking place such as geographical shifts in production to balance water and other resource availability.

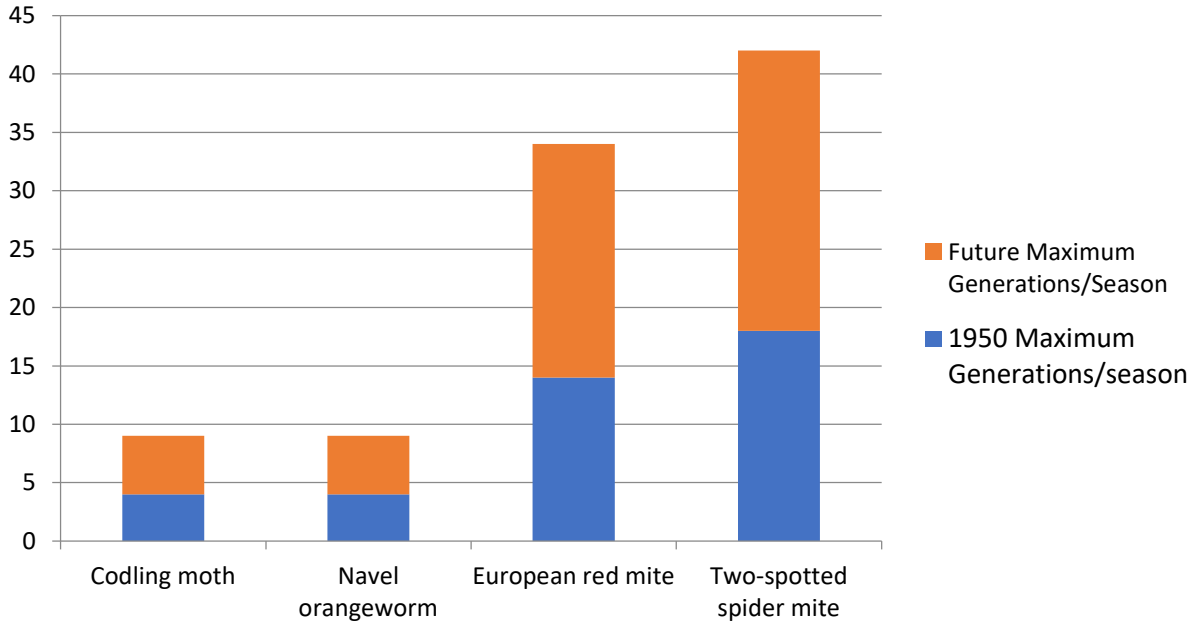
Implications for Pests and Diseases

- Changing distribution and range of pests, weeds, and crop diseases
  - Suitable range of yellow star thistle is expected to increase between 2010 and 2050

- Changes in biological interactions may occur
  - We may see shifts in the lifecycles or ranges of parasites and their hosts, interrupting helpful interactions

Increased Pest Lifecycles

Reproductive rates of some insect pests will increase resulting in increased pest pressure.



Summary of Consequences of Warming

Observation	Related Impact on Specialty Crops
• Decreased snowpack & earlier snowmelt	• Water shortage
• Increased precipitation as rainfall	• Flooding
• Warmer wintertime temperatures	• Low winter chill → irregular flowering and reduced fruit set
• Warm season heat waves	• Various negative impacts to crop phenology due to extreme heat
	• Health impacts outdoor workers
	• Increased pest & disease lifecycles & changed ranges

Thank You!

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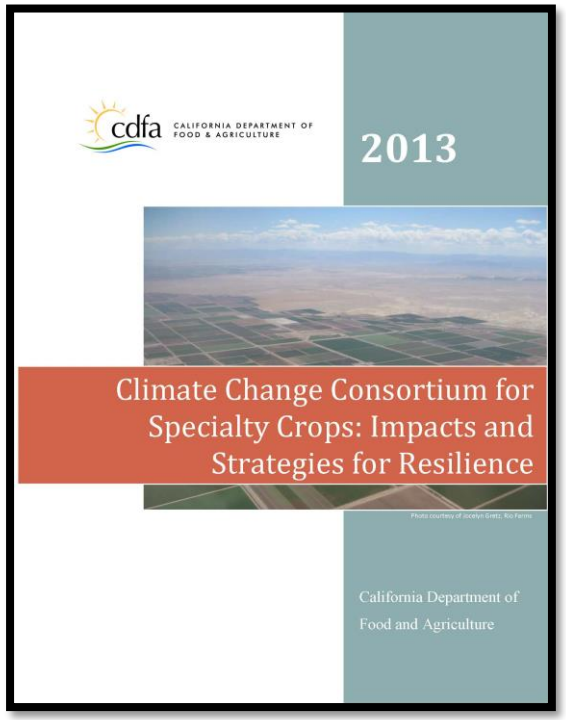

For more information on climate change impacts on California's specialty crops visit the website of CDFA's Climate Change Consortium for Specialty Crops

[CDFA's Climate Change Consortium for Specialty Crops]

Carolyn Cook, MSc.
Senior Environmental Scientist
carolyn.cook@cdfa.ca.gov